

WHAT IS CLAIMED IS:

1. A scanning apparatus, comprising:
a scanner having a measuring device for measuring the shape of a scanned article;
a support assembly adapted for retaining an article and moving through three degrees of freedom relative to the scanner such that the scanner is capable of scanning the exterior of a retained article.
2. A scanning apparatus according to claim 1, wherein the support assembly includes a two degree of freedom linkage rotatably mounted relative to the scanner.
3. A scanning apparatus according to claim 1, wherein the support assembly comprises a two degree of freedom linkage, and an article holder rotatably mounted to the linkage.
4. A scanning apparatus according to claim 1, wherein the support assembly includes a five bar spherical closed loop linkage.
5. A scanning apparatus according to claim 4, wherein the linkage is rotatably mounted relative to the scanner.
6. A scanning apparatus according to claim 4, wherein the support assembly further comprises an article holder rotatably mounted to the linkage.
7. A scanning apparatus, comprising:
a scanner having a measuring device for measuring the shape of a scanned article;

a linkage comprising:

a first ground link;

a second link rotatably mounted to the first link about a first axis;

a third link rotatably mounted to the second link about a second axis;

a fourth link rotatably mounted to the third link about a third axis;

a fifth link rotatably mounted to the fourth link about a fourth axis and
rotatably mounted to the first link about a fifth axis;

an article holder mounted to one of the links adapted for supporting an article to
be scanned exterior of a sphere defined by the linkage;

wherein the scanner and article holder are movable relative to one another to
scan the surface of the article.

8. A scanning apparatus according to claim 7, wherein the links are adapted for
moving along paths of motion that avoid the scanner beam.

9. A scanning apparatus according to claim 7, wherein the article holder is
adjustable to accommodate a range of article shapes and sizes.

10. A scanning apparatus according to claim 7, wherein the article holder is
rotatably mounted to the linkage.

11. A scanning apparatus according to claim 10, wherein the article holder further
comprises a drive motor for rotating the article holder relative to the linkage.

12. A scanning apparatus according to claim 7, wherein the article holder is adapted for holding the article in alignment with an axis of rotation between two of the links.

13. A scanning apparatus according to claim 7, wherein the first ground link is rotatably mounted to a scanner support.

14. A scanning apparatus according to claim 7, wherein the linkage is adjustably mounted relative to the scanner to provide a third degree of freedom.

15. A scanning apparatus according to claim 7, wherein the article holder is adjustably mounted relative to the linkage to provide a third degree of freedom.

16. A scanning apparatus according to claim 14, wherein the article holder is adjustably mounted relative to the linkage to provide a fourth degree of freedom.

17. A scanning apparatus according to claim 7, wherein the linkage includes a first driver and a second driver.

18. A scanning apparatus according to claim 17, wherein the linkage mounts to an arm adjustably mounted to a scanner support and wherein the arm includes a third driver.

19. A scanning apparatus according to claim 17, wherein the article holder is adjustably mounted relative to the linkage and wherein the article holder includes a third driver.

20. A scanning apparatus according to claim 19, wherein the article holder is adjustably mounted relative to the linkage and wherein the article holder includes a fourth driver.

21. A scanning apparatus according to claim 1, wherein the linkage includes a first pair of symmetrical links having a first included angle.

22. A scanning apparatus according to claim 21, wherein the linkage includes a second pair of symmetrical links having a second included angle.

23. A scanning apparatus according to claim 1, wherein the linkage includes a first driver mounted to a first axis of one of the links and a second driver mounted to a second axis of the one of the links.

24. A scanning apparatus according to claim 1, wherein the joints include encoders in communication with a controller for coordinating actuation and movement.

25. A method of scanning an article, comprising the steps of:
providing a scanner device;
providing an article holder;

providing a linkage for moving the scanner device and article holder relative to one another through three degrees of freedom, thereby moving the article through the scanner beam over the entire portion of the article to be scanned.

26. A method according to claim 25, wherein the linkage moves the scanner device and article relative to one another through a scanning pattern having curved paths of motion.

27. A method according to claim 25, further comprising the step of moving the article holder and scanner relative to one another through a fourth degree of freedom.

28. A method according to claim 25, wherein the linkage comprises a five bar spherical closed loop linkage.

29. A method according to claim 28, wherein the linkage is rotated relative to the scanner.

30. A method according to claim 28, wherein the article holder is rotated relative to the linkage.

31. A method according to claim 28, wherein the article holder is rotated relative to the linkage and the linkage is rotated relative to the scanner.

32. A method according to claim 31, comprising the further steps of controlling a first and a second driver moving the linkage, controlling a third driver moving the article holder relative to the linkage, and controlling a fourth driver moving the linkage relative to the scanner.